

PACT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)Date of mailing (day/month/year)
19 December 2001 (19.12.01)

From the INTERNATIONAL BUREAU

To:

BERGGREN OY AB
P.O. Box 16
FIN-00101 Helsinki
FINLANDApplicant's or agent's file reference
49770

IMPORTANT NOTIFICATION

International application No.
PCT/FI00/00422International filing date (day/month/year)
11 May 2000 (11.05.00)

1. The following indications appeared on record concerning:

the applicant the inventor the agent the common representative

Name and Address
NOKIA NETWORKS OY
P.O. Box 300
FIN-00045 Nokia Group
FinlandState of Nationality
FIState of Residence
FI

Telephone No.

Facsimile No.

Teleprinter No.

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

the person the name the address the nationality the residence

Name and Address
NOKIA CORPORATION
Keilalahdentie 4
FIN-02150 Espoo
FinlandState of Nationality
FIState of Residence
FI

Telephone No.

Facsimile No.

Teleprinter No.

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

 the receiving Office the designated Offices concerned the International Searching Authority the elected Offices concerned the International Preliminary Examining Authority other:The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Authorized officer

Anne KARKACHI

Facsimile No.: (41-22) 740.14.35

Telephone No.: (41-22) 338.83.38

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

14

Applicant's or agent's file reference 49770/SKU/PKK	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FI00/00422	International filing date (day/month/year) 11/05/2000	Priority date (day/month/year) 12/05/1999
International Patent Classification (IPC) or national classification and IPC H04Q7/22		
Applicant NOKIA NETWORKS OY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I Basis of the report
- II Priority
- III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV Lack of unity of invention
- V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI Certain documents cited
- VII Certain defects in the international application
- VIII Certain observations on the international application

Date of submission of the demand 07/12/2000	Date of completion of this report 10.08.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Pais Gonçalves, A Telephone No. +49 89 2399 8806



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI00/00422

I. Basis of the report

1. With regard to the elements of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1,4-8 as originally filed

2,3,3a as received on 11/05/2001 with letter of 11/05/2001

Claims, No.:

1-16 as received on 11/05/2001 with letter of 11/05/2001

Drawings, sheets:

1/2,2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI00/00422

the description, pages:

the claims, Nos.:

the drawings, sheets:

5. This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N) Yes: Claims 1-16
 No: Claims

Inventive step (IS) Yes: Claims 1-16
 No: Claims

Industrial applicability (IA) Yes: Claims 1-16
 No: Claims

2. Citations and explanations

see separate sheet

VI. Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/FI00/00422

V.

1. The present invention relates to a method for guaranteeing the quality of a connection, as set forth in the preamble of Claim 1, as well as to a corresponding network element, as set forth in the preamble of Claim 13.
2. This preamble is based in the disclosure of WO-A-99 16266, cited and acknowledged in the opening part of the description. This document discloses a system wherein a data stream can selectively be transmitted either through a packet-switched or through a circuit-switched connection. The problem with this system is related to the fact that, when transmitting a data stream through a packet-switched connection, it is not possible to transmit a **part** of the data stream through the circuit-switched connection in case of deterioration of data quality.
3. This solution is not disclosed in or rendered obvious by the available prior art and Claims 1 and 13 fulfil thus the requirements of Article 33(1) PCT in respect of novelty, inventive step and industrial applicability. The same applies to dependent Claims 1 to 12 and 14 to 16, which contain further refinements of the main embodiments of the independent claims.

VI.

Certain published documents (Rule 70.10)

Application No Patent No	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
WO 00 10348 A2	24.02.00	12.08.99	14.08.98
WO 99 33301 A1	01.07.99	07.12.98	18.12.97

VIII.

1. It is clear from the description, page 2, lines 25 to 31 and page 3, third paragraph, that determining the type of data to be transmitted is a feature essential in order to carry out the invention, in particular to decide how the data is to be transmitted (i.e. packet or circuit-switched).

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/FI00/00422

- 1.1 Since Claims 1 and 13 do not contain this feature, they do not fulfil the requirements of Article 6 PCT in conjunction with Rule 6.3 (a) PCT for not containing all the technical features characterising the invention.

2. In addition, Claim 13 taken alone is also not clear, Article 6 PCT, because it attempts to define the scope of protection by the result to be achieved, Guidelines PG-III 4.7. In particular, it is not clear how the network element has to be arranged in order to be able to partly transmit through a circuit-switched connection (result to be achieved).

and C. Of these, class A terminals are the most advanced and are highly suitable for both packet-based and circuit-switched data transmission. In class A devices both a packet-switched and a circuit-switched connection may be active simultaneously. Class B devices are a little simpler and in them both the packet-switched and circuit-
5 switched connection may exist simultaneously but only one of them may be active at a time. In class C devices, only one of said two connections may be established at a time. A special case of the C class is a terminal device designed purely for packet-based transmission.

Other networks see the GPRS network as an Internet subnetwork. The GPRS network has addresses of its own, which comply with the Internet Protocol (IP). In addition to the GPRS network addresses, mobile stations as well as other network elements in the network have IP addresses that facilitate data transmission between the sender and recipient.

In various packet-based data transmission applications, such as e.g. Internet applications, data may have many different forms. Data may consist of text, speech, images or the like. As data is transmitted in packet format through the GPRS network a problem may arise from the fact that the quality of the data transmitted deteriorates during the transmission for various reasons. The quality of the data is important e.g. in applications in which the data packets transmitted consist of speech data. One such application may be e.g. an Internet call. In such data types the quality of the data transmitted is affected by the delay of data packets, for example.

Patent application WO99/16266 discloses various criteria for selecting an optimal type of bearer to transfer an application flow through a mobile communications network, which offers packet-switched bearers and circuit-switched bearers.

25 An object of this invention is to provide a method for keeping the quality of a connection good, especially in applications in which the data transmitted, such as speech data, requires a good transmission channel quality.

The objects of the invention are achieved by an arrangement in which data is transmitted using both packet-based transmission and circuit-switched transmission.
30 Packet-based transmission is used when the data transmitted is such that a possible deterioration of data quality, caused by delays, for instance, will not degrade the intelligibility of the information contained in the data at the receiving end. Circuit-switched transmission is used when the data transmitted is of a type the intelligibility of which is affected by a possible deterioration of data quality.

The method according to the invention is a method for guaranteeing the quality of a connection in a data-transmitting telecommunication system, where a data stream is arrangible to be transmitted through a packet-switched connection or through a circuit-switched connection and it is characterized in that at least part of a data stream, whose intelligibility is affected by a possible deterioration of data quality, arranged to be transmitted through a packet-switched connection is arranged to be transmitted partly through a circuit-switched connection.

The network element according to the invention is a network element for guaranteeing the quality of a connection in a data-transmitting telecommunication system, where a data stream is arrangible to be transmitted through a packet-switched connection or through a circuit-switched connection, and it is characterized in that it is arranged to transmit at least part of a data stream, whose intelligibility is affected by a possible deterioration of data quality, arranged to be transmitted through a packet-switched connection partly through a circuit-switched connection.

Other advantageous embodiments of the invention are specified in the dependent claims.

In accordance with the invention an arrangement is realized by means of which speech data or the like is not transmitted in packets, but a circuit-switched connection is used to transmit the speech data or the like. The speech data or the like is separated from the rest of the data stream and directed at least partly through a circuit-switched connection to the recipient. The connections are optimized in such a manner that the capacity is used as efficiently as possible from the network standpoint. According to an advantageous embodiment of the invention the speech data or the like is transmitted between an Internet network and mobile station at least partly through a circuit-switched connection. According to a second advantageous embodiment the speech data or the like is transmitted between the packet-switched GPRS backbone network and mobile station at least partly through a circuit-switched connection. According to a third advantageous embodiment the speech data or the like is transmitted between a serving GPRS support node and mobile station at least partly through a circuit-switched connection.

The invention is described in detail in the following, referring to the accompanying Figures in which

Fig. 1 shows a possible topology of the GPRS network,

3a

Fig. 2 shows a possible arrangement according to the invention,

Fig. 3 shows a second possible arrangement according to the invention, and

Fig. 4 shows a third possible arrangement according to the invention.

Like elements in the Figures are denoted by like reference designators. Fig. 1 was
5 discussed above in conjunction with the prior art.

Fig. 2 shows a first embodiment according to the invention for setting up a connection from a mobile station 101 to an Internet network 203 through a packet-switched network. The Internet network 203 is shown to comprise one Internet server 204 with an Internet telephone connection 205. In addition to these network elements
10 Fig. 2 shows a base station 102, base station controller 103, serving GPRS support

Claims

1. A method for guaranteeing the quality of a connection in a data-transmitting telecommunication system, where a data stream is arrangable to be transmitted through a packet-switched connection or through a circuit-switched connection,
5 characterized in that at least part of a data stream, whose intelligibility is affected by a possible deterioration of data quality, arranged to be transmitted through the packet-switched connection is arranged to be transmitted partly through a circuit-switched connection.
2. A method according to claim 1, characterized in that at least one of the
10 parties to the connection is a mobile station (101).
3. A method according to claim 1, characterized in that the data stream is transmitted through at least one Internet server (204).
4. A method according to claims 2 and 3, characterized in that from the mobile
15 station (101) an IP address is sent to an Internet server (204) for establishing a circuit-switched connection.
5. A method according to claim 4, characterized in that the mobile station (101) sends an IP address to the Internet server (204) in the form of a short message.
6. A method according to claim 4, characterized in that the mobile station (101)
20 sends an IP address to the Internet server (204) in a certain packet in the packet data stream.
7. A method according to claim 2, characterized in that a subscriber-specific IP address stored in the mobile communication network is used for the establishment of a circuit-switched connection.
8. A method according to claim 1, characterized in that at least part of the data
25 stream transmitted through a circuit-switched connection is speech data.
9. A method according to claim 8, characterized in that said speech data is transmitted through a circuit-switched connection between the GPRS backbone network (113) and the mobile station (101).
10. A method according to claim 8, characterized in that said speech data transmitted
30 through a circuit-switched connection is transmitted from the gateway (201) directly to an Internet server (204).

11. A method according to claim 1, characterized in that at least part of the data stream arranged to be transmitted through a packet-switched connection is arranged to be transmitted through a circuit-switched connection if the capacity of the packet-switched connection is insufficient.

5 12. A method according to claim 10, characterized in that the quality of the packet-switched connection is monitored during the connection.

13. A network element for guaranteeing the quality of a connection in a data-transmitting telecommunication system, where a data stream is arrangable to be transmitted through a packet-switched connection or through a circuit-switched

10 connection, characterized in that the network element is arranged to transmit at least part of a data stream, whose intelligibility is affected by a possible deterioration of data quality, arranged to be transmitted through a packet-switched connection partly through a circuit-switched connection.

14. A network element according to claim 13, characterized in that the network 15 element is arranged so as to convert the packet data into a form suitable for a circuit-switched connection and vice versa.

15. A network element according to claim 13, characterized in that it is a gateway (201).

16. A network element according to claim 13, characterized in that it is a mobile 20 switching center (104).

PATENT COOPERATION TREATY

SKU / PKK

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

Berggren Oy Ab

To:

BERGGREN OY AB
P.O. Box 16
00101 Helsinki
FINLANDE

PCT 14-08- 2001

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing
(day/month/year) 10.08.2001Applicant's or agent's file reference
49770/SKU/PKK

IMPORTANT NOTIFICATION

International application No.
PCT/FI00/00422International filing date (day/month/year)
11/05/2000Priority date (day/month/year)
12/05/1999Applicant
NOKIA NETWORKS OY et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/

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D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer

Finnie, A

Tel. +49 89 2399-8251



PATENT COOPERATION TREATY

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

BERGGREN OY AB
P.O. Box 16
00101 Helsinki
FINLANDE

Berggren Oy Ab

14-02-2001

PCT

WRITTEN OPINION

(PCT Rule 66)

17. 2/5 - 01

		Date of mailing (day/month/year)	12.02.2001
Applicant's or agent's file reference 49770/SKU/PKK		REPLY DUE	within 3 month(s) from the above date of mailing
International application No. PCT/FI00/00422	International filing date (day/month/year) 11/05/2000	Priority date (day/month/year) 12/05/1999	
International Patent Classification (IPC) or both national classification and IPC H04Q7/22			
Applicant NOKIA NETWORKS OY et al.			

1. This written opinion is the first drawn up by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I Basis of the opinion
- II Priority
- III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV Lack of unity of invention
- V Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI Certain document cited
- VII Certain defects in the international application
- VIII Certain observations on the international application

3. The applicant is hereby invited to reply to this opinion.

When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also: For an additional opportunity to submit amendments, see Rule 66.4. For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis. For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 12/09/2001.

Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer / Examiner Pais Gonçalves, A
	Formalities officer (incl. extension of time limits) Finnie, A Telephone No. +49 89 2399 8251



I. Basis of the opinion

1. This opinion has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed".*).

Description, pages:

1-8 as originally filed

Claims, No.:

1-16 as originally filed

Drawings, sheets:

1/2-2/2 as originally filed

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- the description, pages:
- the claims, Nos.:

the drawings, sheets:

5. This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c));
(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 1-16
Inventive step (IS)	Claims
Industrial applicability (IA)	Claims

2. Citations and explanations
see separate sheet

VI. Certain documents cited

1. Certain published documents (Rule 70.10)
and / or

2. Non-written disclosures (Rule 70.9)
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

The following document (D) is referred to in this written opinion:

D1: WO 99 16266 A1 (Telefonaktiebolage TLM Ericsson) 1 April 1999

V.

1. Document D1 (see in particular page 9, lines 1 to 11 and 22 to 25) discloses, according to the features of Claim 1, a method for guaranteeing the quality of a connection in a data transmitting telecommunication system, wherein the data is arranged to be transmitted through a packet-switched connection (non-real-time type of data) and at least a part of the data (real-time type of data) is arranged to be transmitted through a circuit-switched connection.
 - 1.1 These arguments are also valid for independent Claim 13, which contains the same combination of features as Claim 1 in terms of an apparatus claim, i.e. the apparatus (network element) for carrying out the method of Claim 1.
 - 1.2 Therefore, the subject-matter of Claims 1 and 13 is **not new**, Article 33 (1), (2) PCT.
 - 1.3 Furthermore, it should be noted that, even if novelty of Claims 1 or 13 could be argued based on minor differences between their subject-matter and the disclosure of D1, this subject-matter would still not involve an inventive step, Article 33 (1), (3) PCT, taking into account that D1 discloses the same object and the same type of solution as presently claimed, namely to provide a quality-based service connection.
2. The additional features of dependent claims 2 to 12 and 14 to 16 seem to relate to minor design details and/or implementation measures, which are known or directly derivable from D1.
 - 2.1 These claims thus, either alone or in combination, do not seem to add anything new or of inventive significance to any of the previously-referred claims.

VI.

Certain published documents (Rule 70.10)

Application No Patent No	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (<i>valid claim</i>) (day/month/year)
WO 00 10348 A2	24.02.00	12.08.99	14.08.98
WO 99 33301 A1	01.07.99	07.12.98	18.12.97

VII.

1. The cited document **D1** should be acknowledged and briefly discussed in the opening part of the description, Rule 5.1 (a) (ii) PCT, making clear any inventive contribution of the claimed invention over the prior art.
2. Although being drafted in a two-part form, Claims 1 and 13 do not contain in their pre-characterizing part all the features known from **D1** (refer to section V), Rule 6.3 (b) (ii) PCT.

VIII.

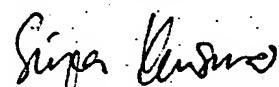
1. It is clear from the description, page 2, lines 25 to 31 and page 3, third paragraph, that determining the type of data to be transmitted is a feature **essential** in order to carry out the invention, in particular to decide how the data is to be transmitted (i.e. packet or circuit-switched).
 - 1.1 Since Claims 1 and 13 do not contain this feature, they do not fulfil the requirements of Article 6 PCT in conjunction with Rule 6.3 (a) PCT for not containing all the technical features characterising the invention.
2. In addition, Claim 13 taken alone is also not clear, Article 6 PCT, because it attempts to define the scope of protection by the result to be achieved, Guidelines PG-III 4.7. Instead, it should describe how the network element has to be arranged in order to be able to partly transmit through a circuit-switched connection (result to be achieved).

Support for the amendments are found in the original page 2, lines 29-31 and in the detailed description of the advantageous embodiments of the invention.

We thus argue that the claimed invention is novel and inventive, and a reconsideration of the Written Opinion is respectfully requested.

To bring the description into conformity with the amended claims, replacement pages 2, 3 and 3a are enclosed. On replacement page 2, a brief description of D1 is also added on lines 22-24. Other amendments on pages 2 and 3 are identical to those in the enclosed amended claims.

BERGGREN OY AB



Sirpa Kuisma
Patent Agent

Encl. Replacement pages 2, 3, 3a, 9 and 10

Berggren Oy Ab

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Trade Reg. No. 80.802
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VAT FI01670027
Kotipaikka Helsinki

and C. Of these, class A terminals are the most advanced and are highly suitable for both packet-based and circuit-switched data transmission. In class A devices both a packet-switched and a circuit-switched connection may be active simultaneously. Class B devices are a little simpler and in them both the packet-switched and circuit-

5 switched connection may exist simultaneously but only one of them may be active at a time. In class C devices, only one of said two connections may be established at a time. A special case of the C class is a terminal device designed purely for packet-based transmission.

Other networks see the GPRS network as an Internet subnetwork. The GPRS network has addresses of its own, which comply with the Internet Protocol (IP). In 10 addition to the GPRS network addresses, mobile stations as well as other network elements in the network have IP addresses that facilitate data transmission between the sender and recipient.

In various packet-based data transmission applications, such as e.g. Internet applications, data may have many different forms. Data may consist of text, speech, 15 images or the like. As data is transmitted in packet format through the GPRS network a problem may arise from the fact that the quality of the data transmitted deteriorates during the transmission for various reasons. The quality of the data is important e.g. in applications in which the data packets transmitted consist of speech 20 data. One such application may be e.g. an Internet call. In such data types the quality of the data transmitted is affected by the delay of data packets, for example.

Patent application WO99/16266 discloses various criteria for selecting an optimal type of bearer to transfer an application flow through a mobile communications network, which offers packet-switched bearers and circuit-switched bearers.

25 An object of this invention is to provide a method for keeping the quality of a connection good, especially in applications in which the data transmitted, such as speech data, requires a good transmission channel quality.

The objects of the invention are achieved by an arrangement in which data is transmitted using both packet-based transmission and circuit-switched transmission. 30 Packet-based transmission is used when the data transmitted is such that a possible deterioration of data quality, caused by delays, for instance, will not degrade the intelligibility of the information contained in the data at the receiving end. Circuit-switched transmission is used when the data transmitted is of a type the intelligibility of which is affected by a possible deterioration of data quality.

The method according to the invention is a method for guaranteeing the quality of a connection in a data-transmitting telecommunication system, where a data stream is arrangable to be transmitted through a packet-switched connection or through a circuit-switched connection and it is characterized in that at least part of a data stream, whose intelligibility is affected by a possible deterioration of data quality, arranged to be transmitted through a packet-switched connection is arranged to be transmitted partly through a circuit-switched connection.

The network element according to the invention is a network element for guaranteeing the quality of a connection in a data-transmitting telecommunication system, where a data stream is arrangable to be transmitted through a packet-switched connection or through a circuit-switched connection, and it is characterized in that it is arranged to transmit at least part of a data stream, whose intelligibility is affected by a possible deterioration of data quality, arranged to be transmitted through a packet-switched connection partly through a circuit-switched connection.

Other advantageous embodiments of the invention are specified in the dependent claims.

In accordance with the invention an arrangement is realized by means of which speech data or the like is not transmitted in packets, but a circuit-switched connection is used to transmit the speech data or the like. The speech data or the like is separated from the rest of the data stream and directed at least partly through a circuit-switched connection to the recipient. The connections are optimized in such a manner that the capacity is used as efficiently as possible from the network standpoint. According to an advantageous embodiment of the invention the speech data or the like is transmitted between an Internet network and mobile station at least partly through a circuit-switched connection. According to a second advantageous embodiment the speech data or the like is transmitted between the packet-switched GPRS backbone network and mobile station at least partly through a circuit-switched connection. According to a third advantageous embodiment the speech data or the like is transmitted between a serving GPRS support node and mobile station at least partly through a circuit-switched connection.

The invention is described in detail in the following, referring to the accompanying Figures in which

Fig. 1 shows a possible topology of the GPRS network,

Fig. 2 shows a possible arrangement according to the invention,

Fig. 3 shows a second possible arrangement according to the invention, and

Fig. 4 shows a third possible arrangement according to the invention.

Like elements in the Figures are denoted by like reference designators. Fig. 1 was

5 discussed above in conjunction with the prior art.

Fig. 2 shows a first embodiment according to the invention for setting up a connection from a mobile station 101 to an Internet network 203 through a packet-switched network. The Internet network 203 is shown to comprise one Internet server 204 with an Internet telephone connection 205. In addition to these network elements

10 Fig. 2 shows a base station 102, base station controller 103, serving GPRS support

Claims

1. A method for guaranteeing the quality of a connection in a data-transmitting telecommunication system, where a data stream is arrangable to be transmitted through a packet-switched connection or through a circuit-switched connection,
5 characterized in that at least part of a data stream, whose intelligibility is affected by a possible deterioration of data quality, arranged to be transmitted through the packet-switched connection is arranged to be transmitted partly through a circuit-switched connection.
10. 2. A method according to claim 1, characterized in that at least one of the parties to the connection is a mobile station (101).
15. 3. A method according to claim 1, characterized in that the data stream is transmitted through at least one Internet server (204).
20. 4. A method according to claims 2 and 3, characterized in that from the mobile station (101) an IP address is sent to an Internet server (204) for establishing a circuit-switched connection.
25. 5. A method according to claim 4, characterized in that the mobile station (101) sends an IP address to the Internet server (204) in the form of a short message.
30. 6. A method according to claim 4, characterized in that the mobile station (101) sends an IP address to the Internet server (204) in a certain packet in the packet data stream.
7. A method according to claim 2, characterized in that a subscriber-specific IP address stored in the mobile communication network is used for the establishment of a circuit-switched connection.
8. A method according to claim 1, characterized in that at least part of the data stream transmitted through a circuit-switched connection is speech data.
9. A method according to claim 8, characterized in that said speech data is transmitted through a circuit-switched connection between the GPRS backbone network (113) and the mobile station (101).
10. A method according to claim 8, characterized in that said speech data transmitted through a circuit-switched connection is transmitted from the gateway (201) directly to an Internet server (204).

11. A method according to claim 1, **characterized** in that at least part of the data stream arranged to be transmitted through a packet-switched connection is arranged to be transmitted through a circuit-switched connection if the capacity of the packet-switched connection is insufficient.

5 12. A method according to claim 10, **characterized** in that the quality of the packet-switched connection is monitored during the connection.

13. A network element for guaranteeing the quality of a connection in a data-transmitting telecommunication system, where a data stream is arrangable to be transmitted through a packet-switched connection or through a circuit-switched

10 connection, **characterized** in that the network element is arranged to transmit at least part of a data stream, whose intelligibility is affected by a possible deterioration of data quality, arranged to be transmitted through a packet-switched connection partly through a circuit-switched connection.

14. A network element according to claim 13, **characterized** in that the network element is arranged so as to convert the packet data into a form suitable for a circuit-switched connection and vice versa.

15. A network element according to claim 13, **characterized** in that it is a gateway (201).

16. A network element according to claim 13, **characterized** in that it is a mobile switching center (104).

The demand must be filed directly with the competent International Preliminary Examining Authority if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/EP

PCT

DEMAND

PCT Chapter 4
M1 DG2

under Article 31 of the Patent Cooperation Treaty:
The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

Identification of IPEA		Date of receipt of DEMAND
Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION		Applicant's or agent's file reference 49770/SKU/PKK
International application No. PCT/FI00/00422	International filing date (day/month/year) 11 May 2000 (11.05.00)	(Earliest) Priority date (day/month/year) 12 May 1999 (12.05.99)
Title of invention Method for improving the quality of a telecommunication connection and a network element		
Box No. II APPLICANT(S)		
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) NOKIA NETWORKS OY P.O. Box 300, FIN-00045 NOKIA GROUP, Finland		Telephone No.:
		Facsimile No.:
		Teleprinter No.:
State (that is, country) of nationality: Finland	State (that is, country) of residence: Finland	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) HUUSKO, Sami Tornitaso 3 As 33, FIN-02120 ESPOO, Finland		
State (that is, country) of nationality: Finland	State (that is, country) of residence: Finland	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)		
State (that is, country) of nationality:	State (that is, country) of residence:	
<input type="checkbox"/> Further applicants are indicated on a continuation sheet.		

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The following person is agent common representative

and has been appointed earlier and represents the applicant(s) also for international preliminary examination.

is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.

is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

BERGGREN OY AB
P.O. Box 16, FIN-00101 HELSINKI, Finland

Telephone No.:

+358 9 693701

Facsimile No.:

+358 9 6933944

Teleprinter No.:

Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION

Statement concerning amendments:*

1. The applicant wishes the international preliminary examination to start on the basis of:

the international application as originally filed

the description as originally filed

as amended under Article 34

the claims as originally filed

as amended under Article 19 (together with any accompanying statement)

as amended under Article 34

the drawings as originally filed

as amended under Article 34

2. The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.

3. The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: English

which is the language in which the international application was filed.

which is the language of a translation furnished for the purposes of international search.

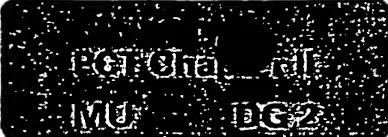
which is the language of publication of the international application.

which is the language of the translation (to be) furnished for the purposes of international preliminary examination.

Box No. V ELECTION OF STATES

The applicant hereby elects all eligible States *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes not to elect:



Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

1. translation of international application	:	sheets
2. amendments under Article 34	:	sheets
3. copy (or, where required, translation) of amendments under Article 19	:	sheets
4. copy (or, where required, translation) of statement under Article 19	:	sheets
5. letter	:	sheets
6. other (specify)	:	sheets

For International Preliminary Examining Authority use only

received	not received
<input type="checkbox"/>	<input type="checkbox"/>

The demand is also accompanied by the item(s) marked below:

1. <input checked="" type="checkbox"/> fee calculation sheet	4. <input type="checkbox"/> statement explaining lack of signature
2. <input type="checkbox"/> separate signed power of attorney	5. <input type="checkbox"/> nucleotide and or amino acid sequence listing in computer readable form
3. <input type="checkbox"/> copy of general power of attorney; reference number, if any:	6. <input type="checkbox"/> other (specify):

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).

BERGGREN OY AB

Sirpa Kuisma
Patent Agent

HELSINKI, Finland 7 December 2000

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:
2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):
3. The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply. The applicant has been informed accordingly.
4. The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.
5. Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on:

FEE CALCULATION SHEET

Annex to the Demand for international preliminary examination

International application No.	PCT/FI00/00422	For International Preliminary Examining Authority use only								
Applicant's or agent's file reference	49770/SKU/PKK	Date stamp of the IPEA								
<p>Applicant NOKIA NETWORKS OY</p>										
<p>Calculation of prescribed fees</p>										
1. Preliminary examination fee	EUR 1533	P								
2. Handling fee (<i>Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.</i>)	EUR 147	H								
3. Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box	EUR 1680									
	TOTAL									
<p>Mode of Payment</p> <table> <tbody> <tr> <td><input type="checkbox"/> authorization to charge deposit account with the IPEA (see below)</td> <td><input type="checkbox"/> cash</td> </tr> <tr> <td><input type="checkbox"/> cheque</td> <td><input type="checkbox"/> revenue stamps</td> </tr> <tr> <td><input type="checkbox"/> postal money order</td> <td><input type="checkbox"/> coupons</td> </tr> <tr> <td><input type="checkbox"/> bank draft</td> <td><input checked="" type="checkbox"/> other (specify): Bank transfer to account 157230-340380</td> </tr> </tbody> </table>			<input type="checkbox"/> authorization to charge deposit account with the IPEA (see below)	<input type="checkbox"/> cash	<input type="checkbox"/> cheque	<input type="checkbox"/> revenue stamps	<input type="checkbox"/> postal money order	<input type="checkbox"/> coupons	<input type="checkbox"/> bank draft	<input checked="" type="checkbox"/> other (specify): Bank transfer to account 157230-340380
<input type="checkbox"/> authorization to charge deposit account with the IPEA (see below)	<input type="checkbox"/> cash									
<input type="checkbox"/> cheque	<input type="checkbox"/> revenue stamps									
<input type="checkbox"/> postal money order	<input type="checkbox"/> coupons									
<input type="checkbox"/> bank draft	<input checked="" type="checkbox"/> other (specify): Bank transfer to account 157230-340380									

Deposit Account Authorization (*this mode of payment may not be available at all IPEAs*)

The IPEA/ EP is hereby authorized to charge the total fees indicated above to my deposit account.

(*this check-box may be marked only if the conditions for deposit accounts of the IPEA so permit*) is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.

Deposit Account Number	Date (day/month/year)	Signature
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PCT REQUEST

Original (for SUBMISSION) - printed on 11.05.2000 09:04:53 AM

0 0-1	For receiving Office use only International Application No.	
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT International Application"	
0-4 0-4-1	Form - PCT/RO/101 PCT Request Prepared using	PCT-EASY Version 2.90 (updated 08.03.2000)
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	National Board of Patents and Registration (Finland) (RO/FI)
0-7	Applicant's or agent's file reference	49770
I	Title of Invention	METHOD FOR IMPROVING THE QUALITY OF A TELECOMMUNICATION CONNECTION AND A NETWORK ELEMENT
II	Applicant This person is:	applicant only
II-1	Applicant for	all designated States except US
II-4	Name	NOKIA NETWORKS OY
II-5	Address:	P.O. Box 300 FIN-00045 Nokia Group Finland
II-6	State of nationality	FI
II-7	State of residence	FI
II-8	Telephone No.	+358-9-51121
II-9	Facsimile No.	+358-9-51168080
III-1	Applicant and/or Inventor This person is:	applicant and inventor
III-1-1	Applicant for	US only
III-1-4	Name (LAST, First)	HUUSKO, Sami
III-1-5	Address:	Tornitaso 3 As 33 FIN-02120 Espoo Finland
III-1-6	State of nationality	FI
III-1-7	State of residence	FI

PCT REQUEST

Original (for SUBMISSION) - printed on 11.05.2000 09:04:53 AM

IV-1	Agent or common representative; or address for correspondence The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: Name Address:	agent BERGGREN OY AB P.O. Box 16 FIN-00101 Helsinki Finland +358-9-693701 +358-9-6933944 email.box@berggren.fi
V-1	Designation of States Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AP: GH GM KE LS MW SD SL SZ TZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT EP: AT BE CH&LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT OA: BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AE AG AL AM AT AU AZ BA BB BG BR BY CA CH&LI CN CR CU CZ DE DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW

PCT REQUEST

Original (for SUBMISSION) - printed on 11.05.2000 09:04:53 AM

V-5	Precautionary Designation Statement In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.	
V-6	Exclusion(s) from precautionary designations NONE	
VI-1	Priority claim of earlier national application	
VI-1-1	Filing date 12 May 1999 (12.05.1999)	
VI-1-2	Number 991092	
VI-1-3	Country FI	
VI-2	Priority document request The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s): VI-1	
VII-1	International Searching Authority Chosen European Patent Office (EPO) (ISA/EP)	
VIII	Check list	
VIII-1	Request	number of sheets 4
VIII-2	Description	8
VIII-3	Claims	2
VIII-4	Abstract	1 49770.txt
VIII-5	Drawings	2
VIII-7	TOTAL	17
VIII-8	Accompanying items	
VIII-9	Fee calculation sheet ✓	
VIII-10	Separate signed power of attorney ✓	
VIII-11	Copy of general power of attorney ✓	
VIII-16	PCT-EASY diskette - diskette	
VIII-17	Other (specified): Copy of Official Action in FI 991092	
VIII-18	Figure of the drawings which should accompany the abstract 2	
VIII-19	Language of filing of the international application English	

PCT REQUEST

Original (for SUBMISSION) - printed on 11.05.2000 09:04:53 AM

IX-1	Signature of applicant or agent	 BERGGREN OY AB Joni Mikkola Patent Agent
IX-1-1	Name	
IX-1-2	Name of signatory	
IX-1-3	Capacity	

FOR RECEIVING OFFICE USE ONLY

10-1	Date of actual receipt of the purported international application	
10-2	Drawings:	
10-2-1	Received	
10-2-2	Not received	
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	ISA/EP
10-6	Transmittal of search copy delayed until search fee is paid	

FOR INTERNATIONAL BUREAU USE ONLY

11-1	Date of receipt of the record copy by the International Bureau	
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PENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 49770	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/ FI 00/ 00422	International filing date (day/month/year) 11/05/2000	(Earliest) Priority Date (day/month/year) 12/05/1999
Applicant NOKIA NETWORKS OY		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing :

contained in the international application in written form.

filed together with the international application in computer readable form.

furnished subsequently to this Authority in written form.

furnished subsequently to this Authority in computer readable form.

the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. Certain claims were found unsearchable (See Box I).

3. Unity of invention is lacking (see Box II).

4. With regard to the title,

the text is approved as submitted by the applicant.

the text has been established by this Authority to read as follows:

5. With regard to the abstract,

the text is approved as submitted by the applicant.

the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

as suggested by the applicant.

because the applicant failed to suggest a figure.

because this figure better characterizes the invention.

2

None of the figures.

1
INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00422

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04Q 7/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04Q, H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9916266 A1 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 1 April 1999 (01.04.99), page 8, line 17 - page 10, line 6; page 11, line 18 - line 24; page 16, line 24 - page 19, line 9 --	1-16
P, A	WO 0010348 A2 (NOKIA NETWORKS OY), 24 February 2000 (24.02.00), page 3, line 10 - line 20, abstract --	1-16
P, A	WO 9933301 A1 (NOKIA MOBILE PHONES LTD.), 1 July 1999 (01.07.99), page 5, line 19 - page 6, line 7 --	1-16

 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document but published on or after the international filing date	"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

2 October 2000

Date of mailing of the international search report

08.11.2000

Name and mailing address of the ISA/
European Patent Office

Authorized officer

Jaana Raivio/mj
Telephone No.

Facsimile No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00422

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9525407 A1 (SIERRA WIRELESS, INC.), 21 Sept 1995 (21.09.95), page 2, line 15 - page 3, line 9, abstract -- -----	1-16

82122

INTERNATIONAL SEARCH REPORT
Information on patent family members

01/08/00

International application No.	
PCT/FI 00/00422	

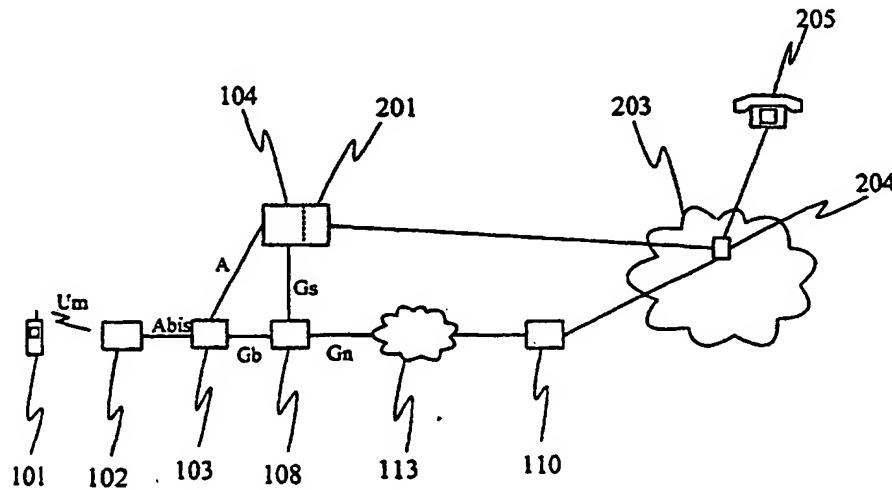
Patent document cited in search report	Publication date		Patent family member(s)	Publication date
WO 9916266 A1	01/04/99	AU EP ZA	9287698 A 1018275 A 9808571 A	12/04/99 12/07/00 31/03/99
WO 0010348 A2	24/02/00	AU FI	5292699 A 981757 A	06/03/00 15/02/00
WO 9933301 A1	01/07/99	AU FI	1437899 A 974558 A	12/07/99 19/06/99
WO 9525407 A1	21/09/95	AU	1943595 A	03/10/95



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : H04Q 7/22		A1	(11) International Publication Number: WO 00/70893 (43) International Publication Date: 23 November 2000 (23.11.00)
(21) International Application Number: PCT/FI00/00422	(22) International Filing Date: 11 May 2000 (11.05.00)	(81) Designated States: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).	
(30) Priority Data: 991092 12 May 1999 (12.05.99) FI			
(71) Applicant (for all designated States except US): NOKIA NETWORKS OY [FI/FI]; P.O. Box 300, FIN-00045 Nokia Group (FI).			
(72) Inventor; and (75) Inventor/Applicant (for US only): HUUSKO, Sami [FI/FI]; Tomitaso 3 As 33, FIN-02120 Espoo (FI).		Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.	
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(54) Title: METHOD FOR IMPROVING THE QUALITY OF A TELECOMMUNICATION CONNECTION AND A NETWORK ELEMENT



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(57) Abstract

The invention relates to a method for guaranteeing the quality of a connection in a data-transmitting telecommunication system. In particular the invention relates to transmission of data through an Internet network, where at least one of the parties to the connection is a mobile station (101). According to the invention, a circuit-switched connection is set up in parallel with a packet-switched data transmission connection, and through that circuit-switched connection it is at least partly transmitted the data that requires a good transmission channel quality. Once such data type is speech data. In accordance with the invention, the circuit-switched connection is given an IP address of its own, which is used in connection establishment and data transmission. The circuit-switched connection may be realized through various arrangements in parallel with the packet-switched connection.

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Method for improving the quality of a telecommunication connection and a network element

The invention relates to a method for transmitting data in data networks, in which method it is ensured that data, especially speech data, is transmitted through a good enough telecommunication connection from the sender to the recipient.

In mobile communication systems the trend is toward packet-based transmission. The idea in packet-based transmission is to transmit the data in packets, so that the connection is used only when data is being transmitted. According to the present transmission arrangement data is transmitted using a circuit-switched arrangement in which the transmission channel is open all the time regardless of whether data is being transmitted or not.

The option of packet-based transmission is about to be included in present digital mobile communication systems, such as the GSM. This is accomplished e.g. by means of the so-called General Packet Radio Service (GPRS) network, the connection of which to, say, the GSM network calls for some new network elements and some changes in the old network elements.

Fig. 1 illustrates a possible arrangement of a GPRS network. Shown in the figure is a mobile station 101 which is connected via a base station 102 and base station controller 103 to a mobile switching center 104. A plurality of different networks, such as a public switched telephone network (PSTN) 105 and an SS7 network 106, for example, may be connected to the mobile switching center 104. The base station controller 103 includes a new network element (PCU, or, Packet Control Unit) 107 which controls the data packets. The packet network proper 114 is connected through the packet control unit 107 to the rest of the network topology. Between the GPRS backbone network 113 and the packet control unit 107 there is a serving GPRS support node (SGSN) 108. The GPRS network also includes a GPRS register 109 which stores information about GPRS equipment, for example. The GPRS network further includes gateway GPRS support nodes (GGSN) 110 through which other packet-based networks 111, such as Internet, OSI data, or X.25 networks, may be connected to the GPRS network. A continuous line between elements in Fig. 1 indicates that there is both data transmission and signaling between the elements. A broken line represents signaling between elements.

The introduction of the packet system brings about changes in terminal equipment. According to a proposal, terminal devices are categorized into three classes A, B

and C. Of these, class A terminals are the most advanced and are highly suitable for both packet-based and circuit-switched data transmission. In class A devices both a packet-switched and a circuit-switched connection may be active simultaneously. Class B devices are a little simpler and in them both the packet-switched and 5 circuit-switched connection may exist simultaneously but only one of them may be active at a time. In class C devices, only one of said two connections may be established at a time. A special case of the C class is a terminal device designed purely for packet-based transmission.

10 Other networks see the GPRS network as an Internet subnetwork. The GPRS network has addresses of its own, which comply with the Internet Protocol (IP). In addition to the GPRS network addresses, mobile stations as well as other network elements in the network have IP addresses that facilitate data transmission between the sender and recipient.

15 In various packet-based data transmission applications, such as e.g. Internet applications, data may have many different forms. Data may consist of text, speech, images or the like. As data is transmitted in packet format through the GPRS network a problem may arise from the fact that the quality of the data transmitted deteriorates during the transmission for various reasons. The quality of the data is important e.g. in applications in which the data packets transmitted consist of speech 20 data. One such application may be e.g. an Internet call. In such data types the quality of the data transmitted is affected by the delay of data packets, for example.

An object of this invention is to provide a method for keeping the quality of a connection good, especially in applications in which the data transmitted, such as speech data, requires a good transmission channel quality.

25 The objects of the invention are achieved by an arrangement in which data is transmitted using both packet-based transmission and circuit-switched transmission. Packet-based transmission is used when the data transmitted is such that a possible deterioration of data quality, caused by delays, for instance, will not degrade the intelligibility of the information contained in the data at the receiving end. Circuit- 30 switched transmission is used when the data transmitted is of a type the intelligibility of which is affected by a possible deterioration of data quality.

The method according to the invention is characterized in that at least part of the data transmitted through a packet-switched connection is arranged so as to be transmitted at least partly through a circuit-switched connection.

The network element according to the invention is characterized in that it is adapted so as to transmit at least part of the data transmitted through a packet-switched connection at least partly through a circuit-switched connection.

5 Other advantageous embodiments of the invention are specified in the dependent claims.

In accordance with the invention an arrangement is realized by means of which speech data or the like is not transmitted in packets, but a circuit-switched connection is used to transmit the speech data or the like. The speech data or the like is separated from the rest of the data stream and directed at least partly through a 10 circuit-switched connection to the recipient. The connections are optimized in such a manner that the capacity is used as efficiently as possible from the network standpoint. According to an advantageous embodiment of the invention the speech data or the like is transmitted between an Internet network and mobile station at least partly through a circuit-switched connection. According to a second advantageous 15 embodiment the speech data or the like is transmitted between the packet-switched GPRS backbone network and mobile station at least partly through a circuit-switched connection. According to a third advantageous embodiment the speech data or the like is transmitted between a serving GPRS support node and mobile station at least partly through a circuit-switched connection.

20 The invention is described in detail in the following, referring to the accompanying Figures in which

Fig. 1 shows a possible topology of the GPRS network,

Fig. 2 shows a possible arrangement according to the invention,

Fig. 3 shows a second possible arrangement according to the invention, and

25 Fig. 4 shows a third possible arrangement according to the invention.

Like elements in the Figures are denoted by like reference designators. Fig. 1 was discussed above in conjunction with the prior art.

30 Fig. 2 shows a first embodiment according to the invention for setting up a connection from a mobile station 101 to an Internet network 203 through a packet-switched network. The Internet network 203 is shown to comprise one Internet server 204 with an Internet telephone connection 205. In addition to these network elements Fig. 2 shows a base station 102, base station controller 103, serving GPRS support

node 108, GPRS backbone network 113, gateway GPRS support node 110, mobile switching center 104 and a gateway (GW) 201. Between the elements there are suitable interfaces to serve the communication between the elements. Exemplary interfaces are shown in Figs. 2, 3 and 4.

5 Let us next consider a situation according to Fig. 2 in which the user of a mobile station 101 has initiated on his class A terminal device a connection to an Internet network 203, in which connection data is transmitted in packets. In this exemplary situation the Internet user wants to set up an Internet call to a person who has on his web site, for example, a so-called click-and-talk button by means of which an Internet call can be established. Thus at least speech data is transmitted during the Internet connection, but some other type of data may be transmitted, too. Normally an Internet call is established through the packet-switched GPRS network. In the arrangement according to the invention the mobile station 101 is arranged, upon establishing an Internet call, to set up a connection via a base station controller 103 to

10 a mobile switching center 104 and further to a gateway 201. The advantage is that the connection from the mobile station 101 to the gateway 201 can be realized at least partly as a circuit-switched connection whereby the quality of the speech data transmitted can be kept better in the transmission. It is obvious to a person skilled in the art that the data sent to and received from the Internet network is in packet format, wherefore said gateway 201, along with other possible functions, is arranged so as to convert the speech data transmitted through the circuit-switched connection to packet format and vice versa.

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When the user initiates a connection to an Internet server 204, IP addresses are used in the establishment of the connection. In this explanatory embodiment the mobile station 101 has an IP address of its own, to which address packet-based data sent from or via the Internet can be transmitted through the GPRS network. If the user of the mobile station 101 initiates a speech connection through a data transmission connection using the Internet Protocol, a second IP address may be advantageously arranged for the mobile station 101, to which second IP address the speech data is transmitted through a circuit-switched connection. Advantageously the address is such that data sent to the address is transmitted from the Internet network to the gateway 201. As the packet-form speech data arrives at the gateway 201, the gateway 201 converts the packet data into data to be transmitted through the circuit-switched connection and transmits said data to the mobile station 101 in accordance with the second IP address sent by the mobile station 101. If there were no separate address for speech data, the speech data would be transmitted to the mobile station

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101 together with other possible data through the packet-switched GPRS network. It is obvious to a person skilled in the art that the speech data sent from the mobile station 101 is also transmitted via the gateway 201 at least partly through a circuit-switched connection to the recipient connected to the Internet network.

5 The mobile station 101 must send to the Internet server 204 the address to which the speech coming from the Internet is directed in packet format so that the speech data can be transmitted through the circuit-switched connection to the mobile station 101. Said IP address may be conveyed in many ways. According to a first example the mobile station 101, when establishing a circuit-switched connection via a mobile 10 switching center 104 and gateway 201, may send the information of the IP address used in the speech connection to the Internet server 204 in a short message. The Internet server 204 reads the address in question and uses it to transmit the speech data. According to a second example the IP address may be sent in a predetermined packet, such as the first packet, to the Internet server 204. The Internet server 204 15 reads the address sent and uses it for the transmission of speech data. According to a third example, an arrangement is realized in a suitable network element e.g. as a database solution according to which a second identifier, such as a second IP address, is attached to the subscriber identification proper of the mobile station 101, to which address the speech data or the like is transmitted. An advantageous 20 location for the identifiers is e.g. the visitor location register (VLR) of the mobile switching center 104. It is obvious to a person skilled in the art that the identifiers may be placed in other such network elements, such as the gateway 201, in which the data can be stored. When a connection is being set up, the device in question finds in the visitor location register in addition to the first subscriber identification 25 data the second subscriber identification data including at least the address to which speech data is to be transmitted. By means of the address it is possible to establish a circuit-switched connection at least between the mobile station 101 and gateway 201 for the transmission of speech data.

In a second advantageous embodiment according to the invention, as depicted in 30 Fig. 3, there is a connection from a base station controller 103 to a mobile switching center 104 in connection of which there is a gateway 201 such as the one described above. In this embodiment the gateway 201 is connected to a node 301 in the packet-switched GPRS backbone network 113. Further, the GPRS backbone network 113 is connected through a gateway GPRS support node 110 to a network 35 using the IP protocol, such as the Internet network 203. A solution according to this arrangement requires that the gateway GPRS support node 110 is adapted so as to

separate the speech data packets coming from the gateway 201 and going to the gateway 201 from the other data packets going to the serving GPRS support node 108. It is obvious to one skilled in the art that node 301 in the GPRS backbone network is arranged so as to be as close as possible to the IP network 203 to which a 5 connection has been established, so that a possible deterioration of the quality of the data transmitted through the circuit-switched connection can be eliminated.

In a third embodiment according to the invention the gateway 201 can be directly connected to a serving GPRS support node 108, as depicted in Fig. 4. The mobile station 101 uses a circuit-switched connection for the transmission of speech data 10 up to the gateway 201 which converts the circuit-switched data into packet format and sends the speech data packets to the serving GPRS support node 108. The serving GPRS support node 108 is arranged so as to see from the speech packets coming from the gateway 201 that the transmission of data is now being carried out in both directions through the gateway 201 and mobile switching center 104. Advantageously this is arranged in a similar manner as e.g. a handover between two 15 base stations 102. It is obvious to a person skilled in the art that this third embodiment according to the invention requires that the gateway 201 supports an interface enabling the arrangement described above. One such interface is the Gb interface of the UMTS (Universal Mobile Telecommunication System) network. It is obvious to one skilled in the art that the requirements according to the third embodiment of the 20 invention can be met by realizing the necessary modifications in the serving GPRS support node 108.

The connections described above are optimized in such a manner that the capacity is utilized as efficiently as possible from the network standpoint. One possible way of 25 optimizing the use of capacity is to leave out, where possible, the connection information needed in the data transmission and to transmit only the data proper. An arrangement like this can be realized for data traffic between a mobile station 101 and gateway 201 where, according to an embodiment of the invention, the whole IP protocol may be left out.

30 It is obvious to a person skilled in the art that in the fourth and fifth embodiments described above the mobile station 101 may be a class A, class B or class C device because the arrangements described above do not require a simultaneous circuit-switched and packet-switched connections at the mobile station 101.

The gateway 201 described above is depicted as a separate network element but it is obvious to one skilled in the art that the gateway 201 may be integrated into a suitable network element, such as a mobile switching center 104.

One possible arrangement for guaranteeing the connection quality is one in which
5 the network elements providing packet-switched data transmission service monitor
the quality of the connection. What is meant by this is that the network elements
may e.g. monitor the data packet delays and other such quantities related to data
transmission. Advantageously the monitoring is arranged in such a manner that if a
10 network element notices e.g. that data packet delays become too long, i.e. the ca-
pacity of the packet-switched service is not sufficient to transmit all data with good
enough quality, at least part of the data transmitted is arranged so as to be transmit-
15 ted through a circuit-switched connection in accordance with the above description.
It is obvious to a person skilled in the art that in the first, second and third embodi-
ments described above the notion is to make sure in advance that the quality of the
connection is good enough for the transmission of the data in question.

The embodiments described above have mainly related to the transmission of speech
data through a circuit-switched connection but it is obvious to one skilled in the art
that the invention is in every respect applicable to a situation in which the speech
data is transmitted through a GSM speech channel. The invention can be applied,
20 within the scope of the intentional idea defined by the claims, to the transmission of
data such as speech data through a circuit-switched connection so that the quality of
the data in question can be guaranteed to be sufficient from the receiver's stand-
point.

It is obvious to a person skilled in the art that the connection described above, which
25 is at least in part a circuit-switched connection between the terminal and gateway
201, can be understood in a broader sense. In addition to the connection types
mentioned here the connection may be e.g. a circuit-switched data connection
through which IP packets containing speech information can be transmitted. On the
30 other hand, the connection may be e.g. a circuit-switched speech connection. One
such connection is typically a so-called bearer in the GSM system, for example. In
the case of a circuit-switched data connection the speech in the IP packets remains
unchanged from the beginning to the end of the connection, whereby the gateway
201 will not convert the speech data from the circuit-switched connection into a
35 form suitable for a packet-switched connection. It is unnecessary since the speech
data in the IP packets is suitable as such to be transmitted through the packet-
switched connection. In the case of a circuit-switched speech connection the gate-

way 201 converts the speech information into packet form so that it is suitable to be transmitted through a packet-switched connection.

It is obvious to a person skilled in the art that while it was above discussed the application of the GPRS network almost solely in connection with an Internet network, it may also be applied to other corresponding network topologies realizing packet switching. The names of the network elements mentioned above are not in any way limiting, but it has been our intention to follow, where applicable, the naming conventions used in the present GSM network.

Claims

1. A method for guaranteeing the quality of a connection in a data-transmitting telecommunication system, where the data is arranged so as to be transmitted through a packet-switched connection, characterized in that at least part of the data transmitted through the packet-switched connection is arranged so as to be transmitted at least partly through a circuit-switched connection.
5
2. A method according to claim 1, characterized in that at least one of the parties to the connection is a mobile station (101).
3. A method according to claim 1, characterized in that the data is transmitted
10 through at least one Internet server (204).
4. A method according to claims 2 and 3, characterized in that from the mobile station (101) an IP address is sent to an Internet server (204) for establishing a circuit-switched connection.
5. A method according to claim 4, characterized in that the mobile station (101)
15 sends an IP address to an Internet server (204) in the form of a short message.
6. A method according to claim 4, characterized in that the mobile station (101) sends an IP address to an Internet server (204) in a certain packet in the packet data stream.
7. A method according to claim 2, characterized in that a subscriber-specific IP
20 address stored in the mobile communication network is used for the establishment of a circuit-switched connection.
8. A method according to claim 1, characterized in that at least part of the data transmitted through a circuit-switched connection is speech data.
9. A method according to claim 8, characterized in that said speech data is transmitted at least partly through a circuit-switched connection between the GPRS backbone network (113) and the mobile station (101).
25
10. A method according to claim 8, characterized in that said speech data transmitted at least partly through a circuit-switched connection is transmitted from the gateway (201) directly to an Internet server (204).

11. A method according to claim 1, characterized in that at least part of the data transmitted through a packet-switched connection is arranged so as to be transmitted through a circuit-switched connection if the capacity of the packet-switched connection is insufficient.
- 5 12. A method according to claim 10, characterized in that the quality of the packet-switched connection is monitored during the connection.
13. A network element for guaranteeing the quality of a connection in a data-transmitting telecommunication system, where the data is arranged so as to be transmitted through a packet-switched connection, characterized in that the network element is arranged so as to transmit at least part of the data transmitted through a packet-switched connection at least partly through a circuit-switched connection.
- 10 14. A network element according to claim 13, characterized in that the network element is arranged so as to convert the packet data into a form suitable for a circuit-switched connection and vice versa.
- 15 15. A network element according to claim 13, characterized in that it is a gateway (201).
16. A network element according to claim 13, characterized in that it is a mobile switching center (104).

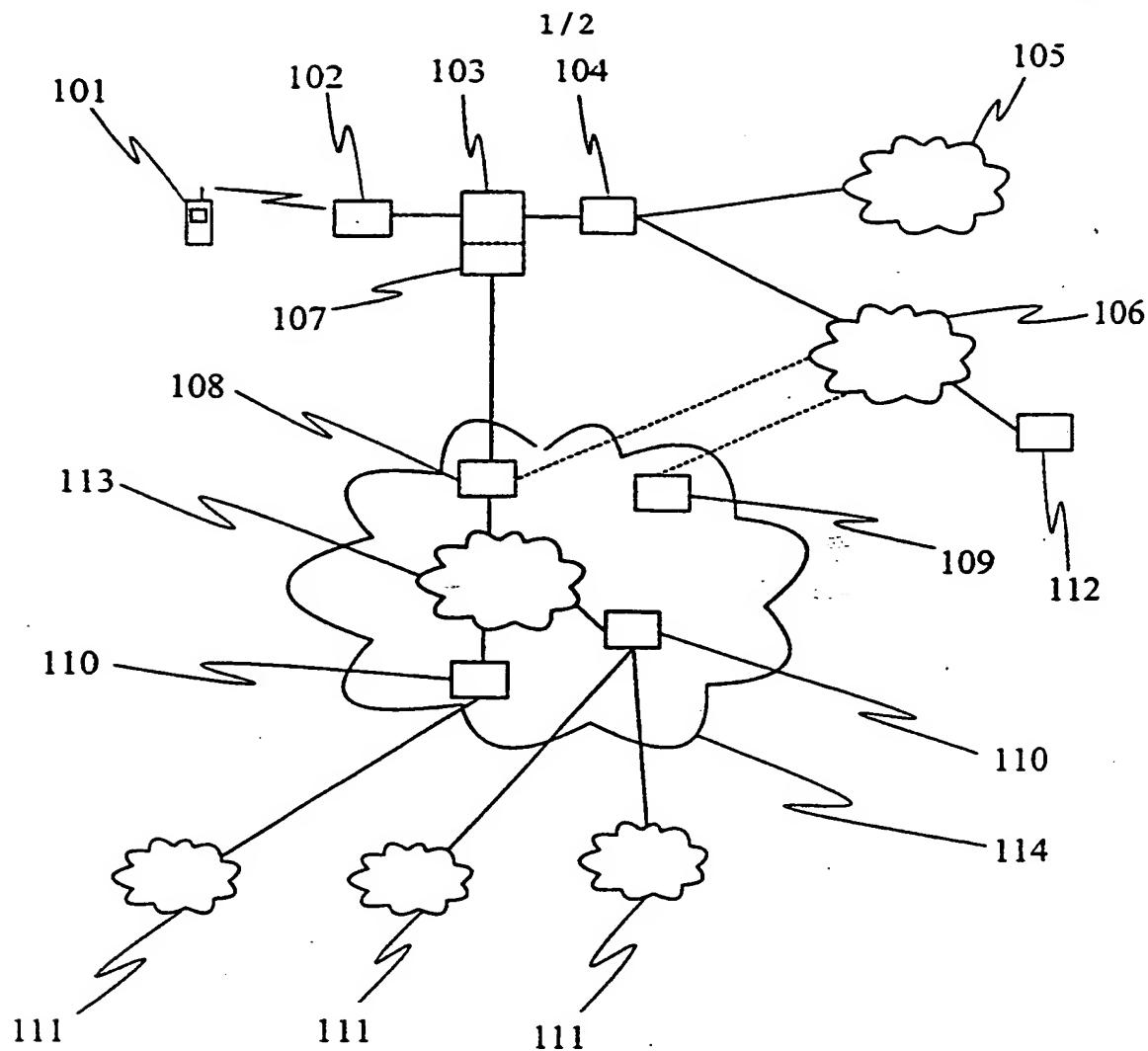


Fig. 1

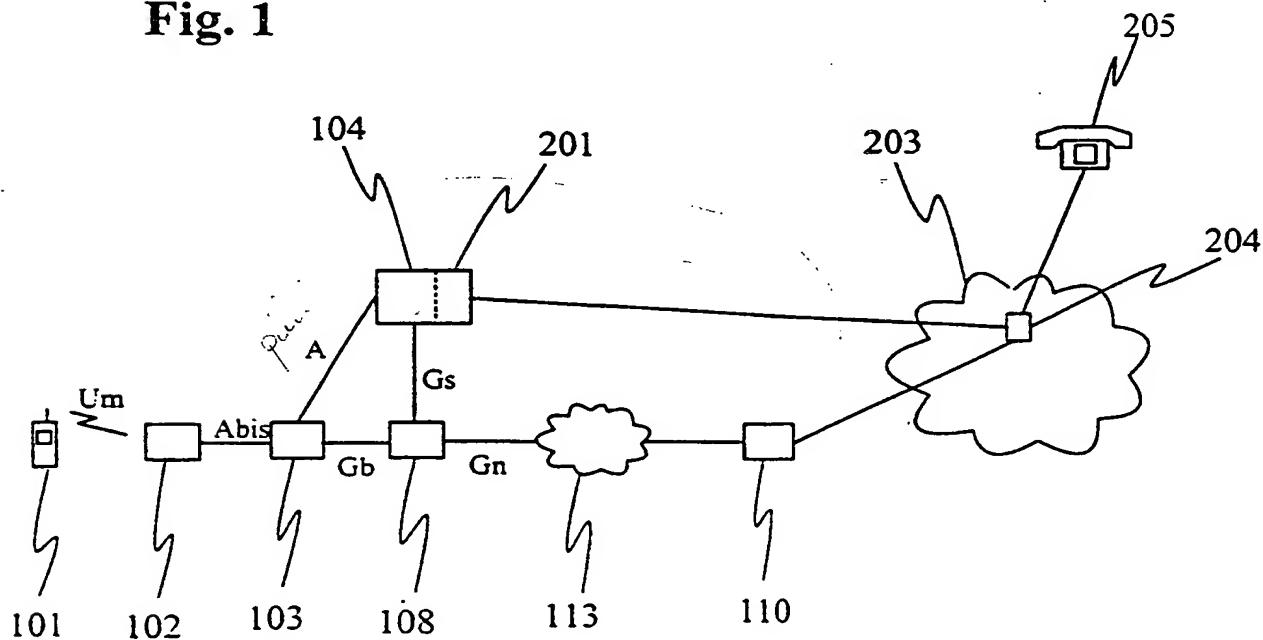


Fig. 2

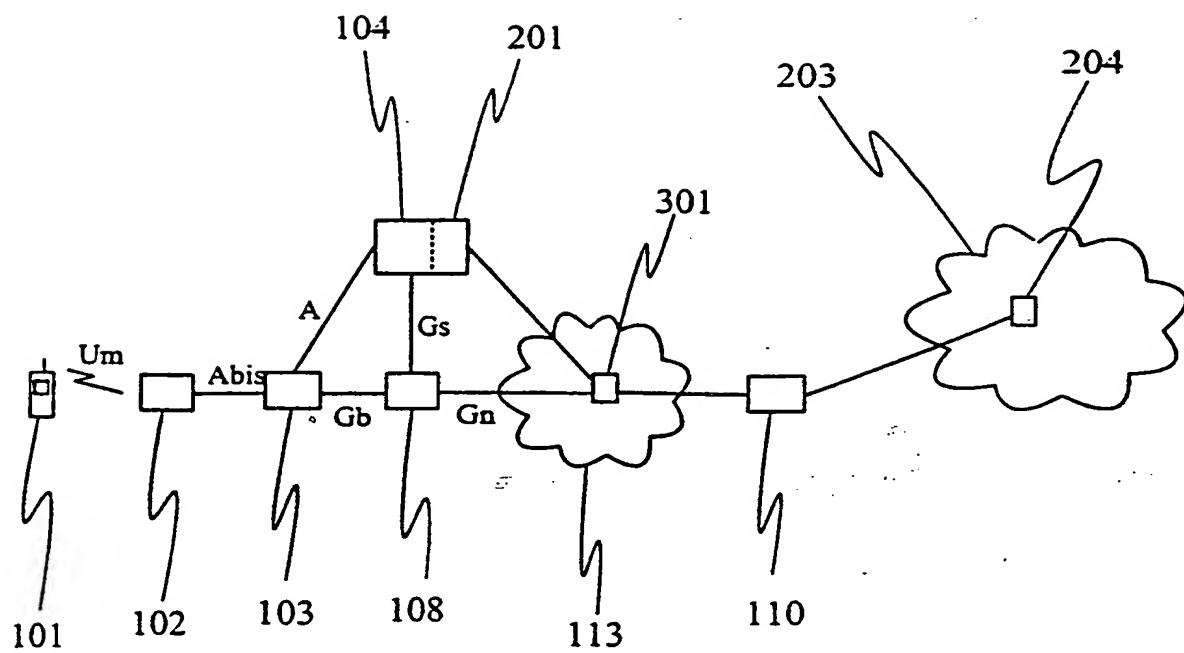


Fig. 3

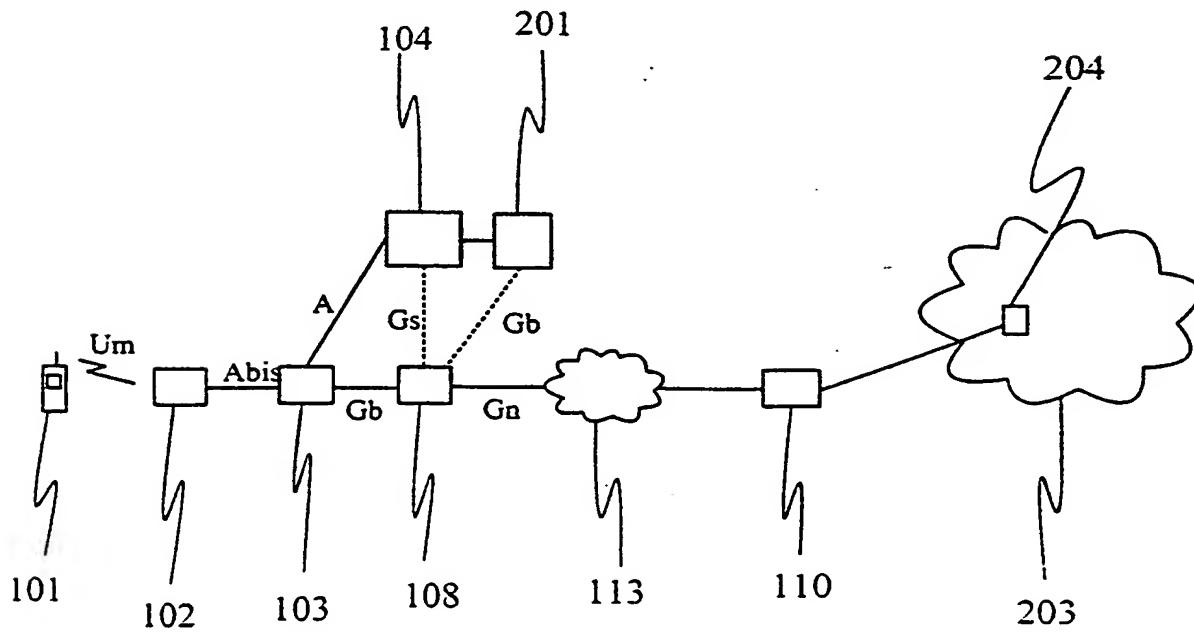


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00422

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04Q 7/22

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Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04Q, H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9916266 A1 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 1 April 1999 (01.04.99), page 8, line 17 - page 10, line 6; page 11, line 18 - line 24; page 16, line 24 - page 19, line 9 --	1-16
P, A	WO 0010348 A2 (NOKIA NETWORKS OY), 24 February 2000 (24.02.00), page 3, line 10 - line 20, abstract --	1-16
P, A	WO 9933301 A1 (NOKIA MOBILE PHONES LTD.), 1 July 1999 (01.07.99), page 5, line 19 - page 6, line 7 --	1-16

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9525407 A1 (SIERRA WIRELESS, INC.), 21 Sept 1995 (21.09.95), page 2, line 15 - page 3, line 9, abstract -- -----	1-16

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/FI 00/00422

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WO 9933301 A1	01/07/99	AU FI	1437899 A 974558 A	12/07/99 19/06/99
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